DOCUMENT RESUME

ED 201 740 CE 028 537

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TITLE An Evaluation of Mobility-Based Occupational Classifications for Placement of Job Applicants.
INSTITUTION Johns Hopkins Univ., Baltimore, Md. Center for Social Organization of Schools.
SPONS AGENCY National Inst. of Education (DHEW), Washington, D.C.
REPORT NO CSOS-R-300
PUB DATE Dec 80
GRANT NIE-G-78-0210; NIE-G-80-0113
NOTE 52p.

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS Adults; *Classification; Demography; Employment Opportunities; *Employment Practices; Evaluation; *Job Analysis; *Job Placement; Labor Market; Literature Reviews; Occupational Clusters; Occupational Information; *Occupational Mobility; *Occupations; Population Trends; Race; Sex; Social Mobility; Transfer of Training; Vocational Adjustment

ABSTRACT

The experimental development of occupational classifications based on regularities of movement of workers among jobs has recently been suggested to assist in placing job seekers into available jobs by A. R. Miller and others in "The Dictionary of Occupational Titles: A Critical Review," 1980. The potential of mobility-based classifications is discussed, and is contrasted with traditional industrial and counseling approaches to worker-job matching. The social and psychological meaning of one such classification is explored by describing the classification's categories in terms of the demographic characteristics of category incumbents (based on data from the 1970 census) and job content (based on "Dictionary of Occupational Titles" and "Position Analysis Questionnaire" data). Results imply that (1) mobility-based classifications provide powerful descriptions of the structure of labor markets; (2) they are related to job content; (3) they are also related to sex and race--apparently well beyond the extent to which this association is shared with job characteristics. Results are interpreted as impying that basing a classification for personnel placement on occupational mobility patterns may incorporate undesirable aspects of existing labor market practices, and that more direct efforts aimed at systematizing knowledge about the transferability of skills wil probably be more productive than relying on mobility-based classifications despite the heuristic value of the mobility approach. (Author)

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An Evaluation of Mobility-Based Occupational Classifications for Placement of Job Applicants

Grant Nos. NIE-G-80-0113
NIE-G-78-0210

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Report No. 300
December 1980

CE028537

Published by the Center for Social Organization of Schools, supported in part as a research and development center by funds from the United States National Institute of Education, Department of Health, Education and Welfare. The opinions expressed in this publication do not necessarily reflect the position or policy of the National Institute of Education, and no official endorsement by the Institute should be inferred.

The Johns Hopkins University
Baltimore, Maryland

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Introductory Statement

The Center for Social Organization of Schools has two primary objectives: to develop a scientific knowledge of how schools affect their students, and to use this knowledge to develop better school practices and organization.

The Center works through four programs to achieve its objectives. The Studies in School Desegregation program applies the basic theories of social organization of schools to study the internal conditions of desegregated schools, the feasibility of alternative desegregation policies, and the interrelation of school desegregation with other equity issues such as housing and job desegregation. The School Organization program is currently concerned with authority-control structures, task structures, reward systems, and peer group processes in schools. It has produced a large-scale study of the effects of open schools, has developed Student Team Learning Instructional processes for teaching various subjects in elementary and secondary schools, and has produced a computerized system for school-wide attendance monitoring. The School Process and Career Development program is studying transitions from high school to post secondary institutions and the role of schooling in the development of career plans and the actualization of labor market outcomes. The Studies in Delinquency and School Environments program is examining the interaction of school environments, school experiences, and individual characteristics in relation to in-school and later-life delinquency.

This report, prepared by the School Process and Career Development program, examines the possibilities of using occupational classifications based on regularities of movement of workers among jobs to help place job applicants. The report is part of the program's general research into the problems of career entry.

Abstract

The experimental development of occupational classifications based on regularities of movement of workers among jobs has recently been suggested to assist in placing job seekers into available jobs (Miller et al., 1980). The potential of mobility-based classifications is discussed, and is contrasted with traditional industrial and counseling approaches to worker-job matching. The social and psychological meaning of one such classification is explored by describing the classification's categories in terms of the demographic characteristics of category incumbents (based on data from the 1970 census) and job content (based on Dictionary of Occupational Titles and Position Analysis Questionnaire data). Results imply that (a) mobility-based classifications provide powerful descriptions of the structure of labor markets, (b) they are related to job content, (c) they are also related to sex and race--apparently well beyond the extent to which this association is shared with job characteristics. Results are interpreted as implying that basing a classification for personnel placement on occupational mobility patterns may incorporate undesirable aspects of existing labor market practices, and that more direct efforts aimed at systematizing knowledge about the transferability of skills will probably be more productive than relying on mobility-based classifications despite the heuristic value of the mobility approach.

Developing schemes for assessing the suitability of individual workers for a variety of jobs has been a continuing goal of industrial and counseling psychologists and psychometricians (Coombs & Satter, 1949; Pearlman, 1980; Super, 1949; Holland, 1973; Guion, 1976; McCormick, 1976). The pursuit of this goal has spawned rating scales, interest inventories, structured job analysis inventories, occupational classifications, taxonomies of human performance, aptitude batteries, task analysis methods, and theories of vocational choice and adjustment.

A National Academy of Sciences Committee (Miller, Treiman, Cain, & Roos, 1980) has recently suggested an alternative to these traditional psychological approaches to matching workers with jobs. Specifically, the Committee suggested exploring the development of classifications based on regularities in the movements of workers among jobs. If workers who have done job X in the past are found to be hired or employed in job Y with considerable frequency, then presumably the two jobs have something in common which makes such transitions especially likely to occur. One possibility is that they require similar worker skills or are suitable for persons with similar preferences. Other possibilities exist.

The present report explores one classification based on regularities in the movements of workers among occupations. It focuses on what occupations within the categories of that classification have in common and how the categories differ. Specifically, it examines the extent to which job analysis data suggest similarities within categories and differences among them; and it examines the extent to which the regularity in inter-occupa-

tional mobility summarized by the classification is also related to education, age, sex, and race.

To provide some perspective on the mobility approach to occupational classification, the concept of worker-job match, the purposes of classification, and some psychological approaches to worker-job matching are first briefly reviewed.

The Concept of Worker-Job Match

Jobs differ in the demands they make of workers. For example, some require a higher degree of visual or auditory acuity, agility, or skill in interpersonal relations than others. Workers also differ in personal characteristics such as sensory acuity, dexterity, or interpersonal skills. The attempt to promote individual welfare or meet the needs of employers by seeking a match between workers and jobs has a long history (DuBois, 1965; Parsons, 1906; Patterson, Gerken, & Hahn, 1953; Patterson & Darley, 1936). The basic idea is that individuals with specific characteristics are best suited for specific kinds of jobs. If a person's characteristics correspond to the demands of the work, it is assumed that the person will be more likely to seek, be hired for, persist in, perform well in, or like that line of work. Today there exists persuasive evidence that the degree of person-job match does result in these outcomes to a certain extent (see, for example, Lofquist & Dawis, 1969; Crites, 1969; Campbell, 1971; Dunnette, 1976; Dunnette & Borman, 1979; Ghiselli, 1973; Owens, 1976). At the same time it is also true that any given individual is suited for many different jobs or occupations. This is so because the range of abilities, interests, or other personal characteristics of workers in a particular occupation is usually wide (Stewart, 1947; Crites, 1969); because the correlations observed

between measures of personal characteristics and any particular outcome are typically modest, usually ranging from .1 to .6 (Dunnette, 1976; Ghiselli, 1973); and because many occupations make similar demands on workers or provide similar rewards (Occupational and Career Analysis and Development Branch, 1977).

One purpose of occupational classifications is to organize occupations into groups that tend to make similar demands on workers or in which workers with more or less distinctive patterns of characteristics are likely to find satisfactory employment. This is a major purpose of occupational classifications intended for counseling and placement.

Purposes of Occupational Classification

Sokal (1974) describes several general purposes of classifications: (a) The arrangement of objects (occupations) into groups or taxa which may be named and related to each other facilitates manipulation and retrieval of information. (b) Classifications achieve economy of memory and aid communication by allowing summarizing and labeling of information. (c) Classifications describe the relations of objects (occupations) to each other so that general statements can be made about classes of objects. (d) Classifications generate hypotheses by raising questions about how the order made perceptible by the classifications has come about. A classification based on occupational mobility may be useful in many of these ways, but still be of limited use in counseling or placement.

Occupational classifications have been sought for purposes other than that of matching workers with jobs. The Census Bureau's classification, stemming from Edwards' early work (1911, 1933) was a more or less ad hoc classification which has been used over the years, with some changes, to

organize information about the socioeconomic composition of the population. The Standard Occupational Classification (Office of Management and Budget, 1977) is a similar classification intended to provide a standard method for organizing occupational data generated by Federal agencies.[1]

Researchers outside of psychology have been concerned with the empirically-based development of occupational classifications for other purposes. Sociologists (Duncan, 1961; Siegel, 1971; Treiman, 1977) have sought classifications that rank order occupations in terms of prestige or socioeconomic status to facilitate the study of who gets ahead. And economists (Cain, Hansen, & Weisbrod, 1967; DauffenBach, 1974; Scoville, 1965; Kelley, Chirikos, & Finn, Note 1) have sought classifications useful for workforce forecasting. In such a classification, "Each class of jobs should be such that the elasticity of substitution among jobs in that class (or rather, among various workers who can perform those jobs) will on average be higher than the elasticity of substitution between jobs in different classes" (Cain et al., 1967). In other words, they seek a classification of occupations such that within a category, occupations can easily exchange incumbents.[2] DauffenBach (1974) and Hartigan and Turner (1980) have directly attacked the problem of developing a classification aimed at the substitution of workers by developing classifications that use patterns in the transfer of workers among jobs as the basis of clustering.

Psychological Approaches

Psychologists have pursued job analysis and classification to assist in personnel placement, selection, compensation, counseling or guidance, and the development of training or promotion schemes. Pearlman (1980) has reviewed much of the psychological work in this area. Many lines of inquiry

have been pursued in analyzing jobs and developing classifications.

One of these is exemplified by the work of McCormick, Jeanneret, and Mecham (1972), who devised a way to assess jobs along dimensions, developed through factor analysis, of "worker-oriented job elements." This line of research focuses on the human behavior performed in getting work done. McCormick and his colleagues developed a questionnaire to assess jobs in terms of several dimensions of worker behavior that characterize differences among jobs. This structured job analysis technique has potential for developing classifications useful in matching workers with jobs--as well as for other purposes, such as suggesting selection devices or contributing to the development of a pay policy. The use of structured job analysis techniques of this kind to develop classifications is well illustrated in the literature (Pass & Cunningham, 1978; Taylor, 1978; Taylor & Colbert, 1978; Mecham, McCormick, & Jeanneret, Note 3).

A second approach to analysis and classification involves describing jobs in terms of the activities or tasks performed. This approach, as opposed to the former, emphasizes what is done rather than what the worker does, and is illustrated by the Air Force work on task analysis (Morsh, 1966) and some aspects of the U.S. Department of Labor's (1972) methods of job analysis. Task inventories are questionnaires, containing a list of tasks, that are usually used to analyze jobs within a fairly narrow range of differences because they usually involve specific or specialized tasks (see U.S. Department of Labor, 1973a, b; Christal, 1974). The classification of some military occupations reported by Morsh (1966) and the classification of managers developed by Tornow and Pinto (1976) show that classification is possible using the task inventory approach.

A third approach to job analysis and classification focuses on the characteristics of workers which are related to job performance. Fleishman (1975) summarizes work on the development of a taxonomy taking this approach.

Other less direct approaches to occupational classification have been pursued by counseling psychologists (Holland, 1973; Holland, Viernstein, Kuo, Karweit,& Blum, 1972; Lofquist & Dawis, 1969; Dawis, Lofquist, Henly, & Rounds, Note 5). This work has attempted to create explicit structures for comparing the characteristics of workers and of occupations. This is important because knowledge of the structure of occupational characteristics and of the structure of worker characteristics is useful in matching workers with jobs only when the relation between job and worker characteristics is spelled out. Although the three psychological approaches to understanding worker job match mentioned earlier may be better suited to explicating the dimensions of occupational and worker characteristics than these indirect or global counseling approaches, they have yet to provide really comprehensive structures for integrating worker and job characteristics.

The emergence of occupational or worker classifications from each of these lines of inquiry testifies to their practical value in organizing knowledge (cf. Pearlman, 1980). The suggestion (Miller et al., 1980) that classifications be developed for use in placement of workers which bypass the direct examination of worker and job characteristics and instead focus directly on the substitutability of workers requires scrutiny. The remainder of this report examines the potential of one such classification for the counseling or placement of workers.

Several alternative classifications have been developed by clustering occupations on the basis of patterns of movement of workers among them.

DauffenBack (1974) provides eight of these, and Hartigan and Turner (1980) provide one. These classifications are all based on 1970 census data (U.S. Bureau of the Census, 1970, 1972) in which each respondent's 1970 occupation was classified into the 3-digit census classification for occupations (U.S. Bureau of the Census, 1971), as was a retrospective report of the person's occupation five years earlier. The 1970 occupational codes are based on more extensive questioning than are the 1965 reports, which also probably incorporate some recall error and underreporting (U.S. Bureau of the Census, Economic Statistics Branch, Note 6).

One of DauffenBach's clusterings was chosen for examination here on the grounds that it was intuitively appealing.[4] The occupational content of the mobility-based clusters is presented in detail elsewhere (Gottfredson & Joffe, Note 7). For the most part the clusters appear sensible and have intuitive appeal. For example, one cluster includes clinical laboratory technologists and technicians, dental hygienists, health record technologists and technicians, therapy assistants, and health technologists and technicians not elsewhere classified. Another cluster is composed of political scientists, sociologists, urban and regional planners, and social scientists not elsewhere classified; and bus drivers, deliverymen and routemen, taxicab drivers and chauffeurs, truck drivers, and guards and watchmen form another cluster (the non-gender-neutral occupational titles are those used in the 1970 census classification). Some occupations, e.g. dentists, physicians, and dieticians, are isolates that

are not clustered with other occupations. This is understandable given the pervasive credential barriers involved, and the heavy investment in specific training regimens required for entry into these occupations. Other clusters also usually accord with common sense or rational groupings, although there are some exceptions. For example, it is not clear on job content grounds why dental assistants and airline stewardesses (flight attendants) should cluster with legal secretaries, medical secretaries, secretaries not elsewhere classified, and typists. That they do cluster together raises questions about how this outcome arises; one possibility, of course, is that the sex and age of the workers may determine their mobility prospects. DauffenBach (1974) notes that the clusters in this classification appear to accord with Scoville's (1969) "job family" classification. In any event, one way of regarding this classification is as a characterization of occupational mobility in the U.S. economy for the 1965-1970 period.[5] It is a portrait that summarizes regularities in occupational transitions in a relatively "theory free" way.

Method

The psychological meaning of the classification just described was analytically examined by using job analysis data and information about the demographic characteristics of incumbents of occupations. Analyses describe the extent to which job content and worker social characteristics discriminate among these mobility-based clusters.

Data

Data used to describe the clusters come from several sources:

1. Job analysis data developed in the process of producing the fourth edition of the Dictionary of Occupational Titles (DOT). The National Re-

search Council Committee on Occupational Classification and Analysis (Miller et al., 1980) has provided scores for 1970 census 3-digit occupations on four dimensions that appear to underlie the ratings of occupations in the DOT. The 46 worker traits and worker functions rated in the DOT were factor analyzed at the census occupation level, resulting in four factors. Standardized ratings that defined these factors were summed with appropriate sign and with unit weight to form scales.[6] This resulted in four scales defined as follows:

(a) Substantive complexity is a scale based on the following fourth edition DOT ratings: data (worker function), GED (general educational development), SVP (specific vocational preparation), intelligence (aptitude rating), verbal (aptitude rating), numerical (aptitude rating), abstract (interest rating), and repetitive or continuous process (temperament rating--scored negatively).

(b) Motor skills is formed by summing the following ratings: things (worker function), motor coordination (aptitude), finger dexterity (aptitude), manual dexterity (aptitude), color discrimination (aptitude), and seeing (physical demand).

(c) Physical demands is formed by summing the following ratings: eye-hand coordination (aptitude), climbing (physical demand), stooping (physical demand), location (working condition), and hazards (working condition).

(d) Undesirable working conditions is formed by summing the following ratings: cold (working condition), heat (working condition), wet (working condition).

These DOT-based data are used as a source of information because the DOT is the single most comprehensive source of information about the content of

occupations. Composite scales derived from the DOT ratings seemed appropriate because research (Miller et al., 1980; Broom, Jones, Jones, & McDonnell, 1977) implies that there is substantial redundancy in the ratings made by the Employment Service.[7]

2. Census data about the aggregate characteristics of workers in each detailed (3-digit) census occupation. The characteristics used were:

(a) Median age for workers employed in an occupation, separately for each sex.

(b) Mean years of schooling completed for persons in the experienced labor force who reported this as their current or most recent occupation.[8]

(c) Percentage of persons in the experienced civilian labor force with this occupation who are men.

(d) Percentage of male workers employed in an occupation who are black.

(e) Percentage of female workers employed in an occupation who are black.

3. Structured job analysis data using the Position Analysis Questionnaire (PAQ; Mecham, McCormick, & Jeanneret, Note 8). In contrast to the DOT information, which resembles task analysis in some ways and which also attempts to infer the characteristics of workers related to performance, the PAQ is the major worker-oriented job analysis instrument in use today. The PAQ archives contain data for 1781 distinct 9-digit DOT occupations. The number of protocols for each of these range from 1 to 877. Using the Classified Index (U.S. Bureau of the Census, 1970), each of these 9-digit DOT codes was recoded to a 3-digit census code, and PAQ dimension scores were aggregated to the detailed census occupation level.[9] This resulted in usable scores for 304 of the 440 census occupations. The PAQ generates

several types of dimension scores, based on various parts of the questionnaire. The thirteen overall dimension scores were used in the present research because these appear to provide the most comprehensive single set of job descriptors.

The following list describes the job component scores used by giving a title, marker items, and illustrative high- and low-scoring occupations identified by occupational title and fourth edition DOT code:[10]

(a) Having decision, communicating, and general responsibilities; advising, negotiating, nonroutine information exchange; president of industrial organization (189.118-022), hospital cleaner (323.687-010).

(b) Operating machines or equipment; setting up/adjusting, assembling, variable setting controls; engineering development technician (003.161-014), food products sales representative (260.357-014).

(c) Performing clerical or related activities; transcribing, keyboard devices, finger manipulation; reservations agent (238.367-018), bricklayer (861.381-018).

(d) Performing technical or related activities; pictorial materials, patterns or related devices, measuring devices; petroleum engineer (010.061-018), kitchen supervisor (310.137-014).

(e) Performing service or related activities; serving or catering, entertaining, supervising nonemployees; music teacher (152.021-010), instrument mechanic (710.381-042).

(f) Regular vs. irregular working schedules; typical day hours, regular hours, variable shift work (-); secretary (201.362-030), air-traffic-control specialist (193.162-014).

(g) Performing routine or repetitive activities; specified work pace, repetitive activities, hourly wage; yarn winder (681.685-154), experimental psychologist (045.061-018).

(h) Being aware of work environment; foot-operated controls, continuous, powered highway or rail vehicles, visual differentiation; motor-grader operator (850.663-033), executive chef (313.131-026).

(i) Engaging in physical activities; walking or running, kneeling or stooping, level of physical exertion; maintenance cement mason (844.364-010), commercial airplane pilot (196.263-014).

(j) Supervising, directing, or estimating; supervision of non-supervisory personnel, direction of supervisory personnel, powered mobile equipment; stationary-engineer supervisor (950.131-014), ordnance artificer (632.261-018).

(k) Public or consumer contacts; sales personnel, buyers, commission; door-to-door sales representative (291.357-010), instrument shop supervisor (722.131-010).

(l) Working in an unpleasant, hazardous, or demanding environment; awkward or confining work space, improper illumination, high temperature; rock contractor (939.281-010), tube tester (726.684-026).

(m) Optional apparel and nontypical work schedule; apparel style optional, informal attire, irregular work; grain farmworker (401.683.010), firebrick and refactory tile bricklayer (861.381-026).

Analyses

A series of multiple discriminant analyses were used to examine the ability of groups of occupational and worker characteristics to discriminate among the clusters, and to describe the differences among the clusters in multivariate terms.[11] Discriminant analyses proceeded in a hierarchical

fashion to examine the incremental validity of personal characteristics (age, sex, race, and education) in discriminating among the clusters beyond the extent to which they can be discriminated using job analysis information alone. Finally, to make the implications of these complex discriminant analyses as concrete as possible, classificatory functions derived as part of the discriminant analyses were used to "predict" cluster membership based on job analysis and worker characteristics. The outcomes of this classificatory procedure are expressed in terms of the percentage of occupations correctly assigned to clusters, and by using Cohen's (1960) kappa.[12]

Results of discriminant analysis using the four scales measuring occupational characteristics as discriminatory variables for clusters with 10 or more census occupations are shown in Table 1. In this table the columns headed "d" show standardized discriminant function coefficients. Columns headed "r" show the correlation between each discriminatory variable and discriminant function scores computed across occupations. These correlations are provided to help interpret the discriminant functions. These results imply that cluster membership is strongly related to job content as assessed by these four scales, and one interpretation of the results is that cluster membership is powerfully related to occupational level.[13]

Insert Table 1 About Here

The results of a discriminant analysis in which worker characteristics are used as discriminatory variables are shown in Table 2. In this case only four (of a potential six) discriminant functions were significant. This table demonstrates that cluster membership is also strongly related to worker characteristics. The most powerful relationship is with a

discriminant function that may be interpreted as educational level (function 1). A function defined by sexual composition (function 2) strongly discriminates the clusters, and a function defined by racial composition (function 3) is a moderately good discriminator.

Insert Table 2 About Here

Both job and worker characteristics are combined in a discriminant analysis for which results are shown in Table 3. Seven (of a possible ten) discriminant functions are significant. Although the last two functions (at least) are trivial in a substantive sense, they are shown for completeness. The first discriminant function implies that occupational and educational level is a potent discriminator among the clusters. Occupations scoring high on this function (if reflected) involve substantive complexity and employ highly educated workers. Low scoring occupations involve motor skills and tend to employ relatively many black workers. A high-scoring occupation on the second most useful discriminant function employs mostly male workers. The third function is related to physical demands, and the fourth to racial composition. The interpretation of the three remaining discriminant functions is unclear, and they share relatively little variance with cluster membership.

Insert Table 3 About Here

When classificatory functions are used to assign occupations to clusters using several different subsets of discriminatory variables, the results presented in Table 4 are obtained. The first row in this table shows the results of assignment to clusters based solely on the four DOT-based job

content scales. It shows that 51% of occupations are correctly classified into their clusters, and the kappa of .46 means that 46% of the greater-than-chance possible assignment has occurred. The next set of results show how efficiently worker characteristics assign occupations to groups. Using information only about mean years of schooling of an occupation's incumbents results in the correct assignment of 39% of the occupations (κ = .31). All personal characteristics combined correctly classify 61% of occupations to clusters (κ= .56). The bottom panel in Table 4 shows the increments to classificatory efficiency when personal characteristics of workers are added to job content estimates in predicting cluster membership. Using mean worker education level does not increase the efficiency of classification. When race, sex, and age are added, however, the efficiency of classification increases markedly. The increase in kappa (.48 to .62) is large in relation to the standard errors.

Insert Table 4 About Here

Although the DOT is a comprehensive source of occupational information, it is based on observer judgment for establishing ratings. Consequently, analyses that parallel those just presented but which are based on an independent and relatively objective source of occupational information are also useful. The results of a discriminant analysis using these PAQ dimension scores as discriminatory variables are shown in Table 5. Only 6 of the possible 13 discriminant functions were significant, and only 4 of these have relatively clear interpretations. As with the discriminant analysis using scales derived from the DOT, the first and most powerful function is related to occupational level. The second (if reflected) is defined by service

rather than technical activities. The third is related to public contacts, and the fourth to responsibility and physical and technical activities.

Insert Table 5 About Here

Results for personal characteristics that parallel the earlier (Table 2) analyses, except that they are performed using only occupations for which PAQ dimension scores were available, are shown in Table 6. All four discriminant functions closely parallel the functions derived in the earlier analysis, but all are reflected. It is reassuring to find this similar pattern in the more restricted sample of occupations for which PAQ data were available.

Insert Table 6 About Here

The results of a discriminant analysis using PAQ dimensions and worker characteristics as discriminatory variables are shown in Table 7. Two potent discriminant functions are readily interpretable: The first is related to occupational level, and the second to technical vs. service activities, and to racial and sexual composition of the occupations.

Insert Table 7 About Here

The incremental efficiency obtained when worker characteristics are added to the PAQ job dimension data to assign occupations to clusters is shown in Table 8. When only the PAQ data are used to "predict" cluster membership, 48% of occupations are correctly assigned ($\kappa = .44$). Adding information about years of schooling for the average worker increases the hit rate to 54% ($\kappa = .50$). Adding other personal characteristics (information about the race, sex, and age of workers in the occupation) increases

the efficiency of assignment considerably--64% hits, $\kappa = .60$. The successive increases in kappa are large in relation to the standard errors.

Insert Table 8 About Here

Discussion

This report has two purposes: (a) to explore the occupational content of a mobility-based occupational classification to learn about the structure of occupational transfers in the U.S. economy, and (b) to critically examine the potential of a mobility-based classification scheme for use in placement. The report suffers from the following limitations in serving these objectives:

1. No unequivocally comprehensive and valid source of information about the characteristics of jobs that are relevant to the transferability of skills exists. This research uses archival job analysis data from the fourth edition of the DOT and from the PAQ to describe job content. The first source is the only available source of information about the job content of the U.S. economy that aims to be comprehensive. Limitations of the coverage, content, and psychometric properties of the DOT data are elaborated elsewhere (Miller et al., 1980; Cain & Green, Note 9). The PAQ appears to represent the state of the art in assessing the major dimensions of jobs in worker-oriented terms, and fortunately the PAQ archives now contain multiple job descriptions that can be linked with most census occupations. The major limitations here are that these data were not available for all the census occupations, and that the PAQ instrument (as is also true of the DOT ratings) may be somewhat better at discriminating among the characteristics of production occupations than of high-level technical,

service, managerial, or professional occupations.

2. As a practical matter, the census occupation was the basic unit of classification and aggregation. This provides a limitation for the original clustering and for subsequent analyses. In many cases the census occupations might profitably be disaggregated. This limitation is unavoidable because social statistics about workers are available only at this level.

3. In assessing the incremental utility of the social characteristics of workers in describing the clusters beyond that possible using the job analysis data, two limitations are inherent. The first is that the job analysis data available may not comprehensively describe job content in terms relevant to explaining mobility. The second is that these social characteristics of workers may be related to job-relevant skills or dispositions, and their utility therefore may incorporate explanatory elements that are not irrelevant to transferability of skills.

A consequence of these limitations is that the present results are suggestive only. They should not be regarded as providing precise estimates of the extent to which barriers or systematic patterns in occupational mobility are related to irrelevant social characteristics, bias, and so forth. Despite these limitations the results are highly suggestive. They serve to provide a description of patterns in occupational mobility, and they have implications for the search for occupational classifications for use in placement. The following paragraphs discuss some of the more salient features of the results and speculate about their implications for placement research.

The strong statistical relations between occupational clusters based on mobility and the completely independent descriptions of occupations derived from the Employment Service (DOT) job analysis data and the worker-

oriented (PAQ) job analysis data are important results. The finding that four discriminant functions are useful in discriminating among the mobility-based occupational clusters using the scores based on DOT ratings implies that all four of those scales convey useful information. Discriminatory power would be lost if there were fewer. The finding using PAQ data that six discriminant functions are useful in discriminating among the clusters implies that fewer than 13 component scores could result in the same degree of efficiency in classifying occupations. (This does not, of course, imply that a larger number of dimensions lack utility for some other purposes.) Using either the four scales based on DOT ratings or the PAQ overall dimension scores, a substantial degree of predictive efficiency is attained. The high percentages of correct classification (51% and 48%, respectively) and kappas (.46 and .44) imply a strong association between patterns of job content and patterns of actual mobility of workers among jobs. One interpretation of these results is that these job analysis data represent dimensions of occupational content that are related to transferability of skills. Other interpretations--involving, for example, worker preferences or employer dependence on irrelevant credentials--are also possible, however.

The observation that the mobility-based clusters are also related to worker demographic or social characteristics is also important. Cluster membership is especially strongly associated with average years of schooling and sexual composition of the occupations, although the racial composition of the occupation is also related to cluster membership. Indeed, the personal characteristics, taken together, are better predictors of the cluster membership of an occupation than either of the two kinds of job analysis data used. This outcome underscores the need for caution in assuming that occupational mobility usefully reflects the transferability

of skills. There is at least as much reason to assume that occupational transfers reflect employer preferences or biases (Noland & Bakke, 1949), personal preferences or the limited horizons of workers (Gottfredson, Holland,& Gottfredson, 1975), or other characteristics of workers that may be related or unrelated to transferable skills.

The results imply that even when the best available descriptions of the job content of occupations and information about the educational level of workers are used, a large increase in the efficiency of classification of occupations to mobility-based categories results by using the sex, race, and age composition of occupations as well. This outcome is a sharp warning of the potential hazards in using a classification of occupations based on patterns of the actual movement of workers among jobs in the labor market. This need for caution, duly noted by the Committee on Occupational Classification and Analysis (Miller et al., 1980), is dramatically illustrated by these results.

Occupational segregation by sex and to a lesser degree race are phenomena with major social implications. The median earnings for year-round full-time women workers in 1977 was 59% that of men--$8,618 vs. $14,626 (U.S. Bureau of the Census, 1979). A large part of this earnings gap between men and women appears attributable to their employment in different occupations. In 1979, 80% of clerical workers were women, whereas only 24% of managers and administrators (except farm) and 6% of craft and kindred workers were women (U.S. Department of Labor, 1980). Because pay rates differ in different occupations, and because women are concentrated in lower paying occupations than are men, they earn less.

The use in placement or counseling of a classification which disproportionately directed women into lower paying occupations warrants careful

scrutiny. Such a classification should be based on the actual preferences or job-related talents of the individuals involved to avoid needlessly perpetuating the income gaps among social groups. The present results imply that the mobility-based classification examined here has the potential to needlessly perpetuate those gaps. Several clusters employ mostly women and are relatively poorly paid (see Gottfredson & Joffe, Note 7). A classification such as the mobility-based classification considered here has potential problems if used in placement, because personal characteristics of the workers in an occupation, including sex, race, and age, are related to cluster assignment beyond the extent which can be accounted for by available job analysis information. The results do not demonstrate that the mobility-based clusters therefore necessarily incorporate inappropriate or biased labor market practices, but they do imply that this is a clear possibility--more so because the increase in classificatory efficiency obtained when social characteristics of workers are added to job analysis information in predicting cluster membership is large.

A classification based primarily on observed transfers of workers among jobs will in general be likely to show associations with social characteristics of workers unless explicit steps are taken to prevent such associations in defining the basis of the clustering. Even then, there appears to be no clear way to separate appropriate from inappropriate associations between clusters and the social characteristics of workers.

A more straightforward way to create classifications for use in placement is to base classification more directly on the transferability of skills by using measures of job-related knowledge, skill, and temperaments

that persons have and measures of the kinds of knowledge, skill, and temperaments that are demonstrably related to performance, persistence, or satisfaction on the job.[14] This approach accords with the prevalent approach to occupational classification in industrial and counseling psychology (e.g., Shaw, DeNisi,& McCormick, Note 4; Dawis, Lofquist, Henly, & Rounds, Note 5) more closely than it does with an attempt to build classifications on the basis of observed patterns in mobility. This latter only indirectly gets at transferability. It focuses on transfers, however they arise.

Despite these drawbacks of mobility-based clusters, the analysis of mobility has research potential. The regularities in mobility summarized by the classifications created by Dauffenbach (1974) and by Hartigan and Turner (1980) have heuristic value in raising the question of how the regularities they make apparent came about. The present research is a first step in accounting for these regularities. It shows that patterns of mobility are related to (a) the content of the jobs, (b) the level of the jobs, and (c) sex and race. This raises a host of questions for future research: Why are patterns in mobility associated with sex beyond the extent which can be accounted for by existing job analysis information? Are important dimensions of jobs that are related to transferability not now measured? Do worker preferences help to explain these patterns? Employer practices?

Finally, the present results can be used to provide evidence about the construct validity of job analysis information. Throughout most of this report we have written as if we were using job analysis information as a way of evaluating the mobility-based clusters. But the results can also be taken as evidence of the validity of the job analysis information.

In the discriminant analyses, one can think of the occupational clusters as a set of dummy variables in a canonical analysis sense. The canonical correlations shown are correlations between composites formed of these dummy variables and composites formed of the job analysis data. Many of these correlations are impressive in size, providing impressive evidence of validity for both the PAQ- and DOT-based measures. Four discriminant functions (all that are possible) are useful with the four DOT-based scales, but six functions were useful with the thirteen PAQ composite scales. This implies that more dimensions (at least two) than the four assessed by the DOT-based scales are necessary to account for differences among clusters. In other words, despite their impressive ability to discriminate occupational groups based on patterns in transfer of workers, the four DOT-based scales are not comprehensive. More work to determine the number of job dimensions required to account for mobility and their content seems worthwhile.

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Footnotes

This research was supported in part by Grants NIE-G-78-0210 and NIE-G-80-0113 from the National Institute of Education, Department of Health, Education, and Welfare. This report draws on discussions with John A. Hartigan, Ernest J. McCormick, Ann R. Miller, and Charles F. Turner. We are grateful to Linda S. Gottfredson and Patricia Roos for helping us locate and use Census and Department of Labor data, and to Robert Mecham for making Position Analysis Questionnaire Data available. No agency, institute, or committee endorses the opinions expressed--they are solely the authors'. Request reprints from Gary D. Gottfredson, Center for Social Organization of Schools, The Johns Hopkins University, 3505 N. Charles Street, Baltimore, MD, 21218.

[1] Pearlman (1980) has described the development of these classifications as "essentially rational" (p. 13), because they involve judgments about the overall nature of the jobs to be grouped.

[2] Substitutability within categories has often implicitly been the basis of the evaluation of psychological and other occupational classifications. See Roe, Hubbard, Hutchinson, and Bateman (1966), Gottfredson (1976, 84-85), and Turner (Note 2). Economists are aware, of course, that factors other than job content per se influence substitutability of labor. Labor supply is sometimes assumed to be determined by peoples' decisions to "invest in human capital" (e.g. to increase their productivity potential by increasing their skills or educational level) in ways that develop human resources differentially (Kelley et al., Note 1, Chapter 1), and by demographic variables such as marriage and family size patterns and the age composition of populations (Oppenheimer, 1970; U.S. Department of Labor, 1975).

[3] DauffenBach (1974) produced cluster solutions of four types, with each of the four types represented by two solutions--one with altered diagonals in the mobility matrix and one with unaltered diagonals. He analyzed matrices involving recruitment rates (or ingressive models) and transition rates (or egressive models), and he used both city-block and Euclidean distance metrics. See his original report for details and a discussion of the alternative models. In general, however, the egressive models involved the probability of transitions of the form

$$p_{ij} = n_{ij}/\Sigma_j n_{ij}$$

where j takes values 1 to the number of occupations. The ingressive models involved matrices of recruitment rates with elements

$$r_{ij} = n_{ij}/\Sigma_i n_{ij}$$

when $i \neq j$ and i takes values 1 to the number of occupations plus 1 (to allow for recruitment from non-work status); when $i = j$, $r_{ij} = 0$. DauffenBach used complete linkage clustering.

Hartigan and Turner (1980) clustered a different matrix, and they used single linkage clustering. (They also provide a brief critique of DauffenBach's methods, as well as their own.) They clustered a distance matrix with elements $d_{ij} = 1/\min(t_{ij}, t_{ji})$, where

$$t_{ij} = \frac{n_{ij}N}{n_{i\bullet}n_{j\bullet}}$$

and diagonal cells are ignored.

[4] The clustering used was based on DauffenBach's P matrix (see footnote 4) using a city-block metric and retention rates in the diagonal (his cluster

configuration I). The distance metric for this clustering was

$$d_{ij} = \sum_k (|p_{ik} - p_{jk}|).$$

In defining the solution we examined, all agglomerations with a cluster value of 1.8002 or lower were used.

5 No data of comparable scope for a more recent period are available. Retrospective reports of occupations for earlier years were not collected in the 1980 census.

6 Use was made of the April 1971 Current Population Survey in which respondents' occupations were coded using both the Census three-digit codes and the third edition DOT codes. A map relating third to fourth edition DOT codes was used to add fourth edition DOT codes to this tape (excluding, in the process, 6,984 of the 60,441 cases for which mapping was not possible). Then the records were aggregated to the 1970 census three-digit categories, and the worker traits and worker functions were factor analyzed. Because not all three-digit census occupations were represented in the file, values on the factors were imputed using judgment for some occupations. See Appendix F of the report (Miller et al., 1980) for details. In preparing to use these scores in the present research, we used a different method of imputing scores for the missing census occupations. We attempted to identify DOT occupations that represented the missing census occupations using the Classified Index (U.S. Bureau of the Census, 1971) and the DOT as references. Then we used a computer tape of the DOT worker traits and functions data to aggregate traits and functions for these occupations at the census code level. We scored these aggregate values in the same way as they were scored for other occupations, and we averaged the earlier researcher's imputed

scores with those created in this way, except that when this appeared inappropriate--as when an apprentice received a higher score than a journeyman--the original score was not altered for that occupation. A table showing the values used is available from the authors.

7 Because these scales are new, and their psychological meaning may be unclear, analyses reported elsewhere (Gottfredson & Joffe, Note 7) use the data, people, things, GED, and SVP ratings from the third edition of the DOT. Although these supplementary analyses may be of some interest, they are flawed because the ratings of occupations in the third edition may have underestimated the worker functions rating for work done mainly by women (Miller et al., 1980). Any such systematic differential related to sex composition of an occupation would tend to make occupational characteristics appear to be more powerful discriminators among occupational groups than would unbiased occupational ratings.

8 A weighted composite of years of schooling reported by the census bureau separately for men and women was used.

9 We are grateful to Robert Mecham of PAQ Services, Data Processing Division, P.O. Box 3337, Logan, Utah 84321 for making these proprietary data available to us in aggregated form. Without access to these archives this research could not have been done.

10 Adapted from Mechem, McCormick, and Jeanneret (Note 8).

11 The content of all clusters that include five or more census occupations are described by reporting means and standard deviations in Gottfredson and Joffe (Note 7).

[12] The standard errors for kappa shown in the tables are based on the corrected formula provided by Fleiss, Cohen, and Everitt (1969). Kappa is calculated as follows:

$$\kappa = \frac{p_o - p_c}{1 - p_c}$$

where p_o is the sum of the proportions of cases correctly assigned and p_c is the expected number correctly assigned given the marginal distributions. Kappa may be interpreted as the proportion of greater-than-chance possible agreement which is observed to occur.

[13] Gottfredson and Joffe (Note 7) show group centroids for occupational clusters for each set of discriminant analysis results. These tables are helpful in interpreting the results.

[14] This appears most appropriate for jobs that require long training times or specialized skills or knowledge. It appears likely that basing classifications on more general abilities related to performance or persistence may be useful for many occupations, especially for those with short training times (cf. Occupational and Career Analysis and Development Branch, 1977).

Table 1

Standardized Multiple Discriminant Function Coefficients and Correlations of Discriminatory Variables with Functions in a Discriminant Analysis of Mobility-Based Occupational Groups: Occupational Analysis Scales from Department of Labor Data

Discriminatory variable	Fn. 1		Fn. 2		Fn. 3		Fn. 4	
	r	d	r	d	r	d	r	d
Substantive complexity	.92	.95	.38	.42	-.20	.00	-.25	-.19
Physical demands	-.44	-.54	.57	.40	-.70	-.71	-.37	-.36
Motor skills	-.44	-.18	.68	.75	.44	.50	.32	.42
Undesirable working conditions	-.29	-.04	.06	.06	.44	.44	-.66	-.92
Percent of variance		80.75		11.61		5.54		2.09
Canonical R		.92		.67		.52		.36
Λ before removing this function		.05**		.35**		.63**		.87*

Note. N for discriminant analysis is 210. N's for correlations of discriminatory variables with discriminant scores range from 375 to 427.

* p <.01

** p <.001

Table 2

Standardized Multiple Discriminant Function Coefficients and Correlations of Discriminatory Variables with Functions in a Discriminant Analysis of Mobility-Based Occupational Groups: Personal Characteristics

Discriminatory variable	Fn. 1		Fn. 2		Fn. 3		Fn. 4	
	r	d	r	d	r	d	r	d
Median employed male age	.14	.10	-.33	-.24	-.06	-.36	.50	.00
Median employed female age	.25	.02	-.09	.00	.29	.46	.93	.91
Years of education[a]	-.98	-1.00	-.27	-.17	-.06	.34	-.04	.00
Percentage male[b]	.16	.28	-.96	-.90	-.07	-.18	-.13	-.16
Percentage black (men)[c]	.45	.10	.36	.06	.81	.79	-.20	-.40
Percentage black (women)[c]	.40	-.15	.18	-.11	.70	.26	.10	.24
Percentage of variance		71.11		9.81		4.52		3.10
Canonical R		.93		.81		.55		.48
Λ before removing this function		.02*		.17*		.48*		.68*

Note. N for discriminant analysis is 210. N's for correlations of discriminatory variables with discriminant scores range from 375 to 427.

[a] A weighted composite of men's and women's schooling for persons in the experienced civilian labor force.

[b] Experienced civilian labor force.

[c] Employed workers.

* $p < .001$

Table 3

Standardized Multiple Discriminant Function Coefficients and Correlations of Discriminatory Variables with Functions in a Discriminant Analysis of Mobility-Based Occupational Groups: Occupational Analysis Scales from Department of Labor Data and Personal Characteristics

Discriminatory Variable	Fn 1		Fn 2		Fn 3		Fn 4		Fn 5		Fn 6		Fn 7	
	r	d	r	d	r	d	r	d	r	d	r	d	r	d
Substantive complexity	-.86	-.54	.40	.38	.02	-.28	-.21	.14	-.34	-.99	-.11	.01	-.02	.52
Physical demands	.33	.23	.10	.00	.68	.92	-.41	-.26	-.22	-.08	-.18	-.21	-.32	-.49
Motor skills	.47	.09	.37	.20	.26	.30	.24	.33	.01	-.04	.28	.57	.21	.14
Undesirable working conditions	.31	.05	.07	.06	-.05	-.14	.24	.15	.02	-.05	-.46	-.70	-.05	-.08
Median employed male age	.10	.19	.30	.13	-.27	-.11	-.03	-.33	.06	.42	.34	.47	-.53	-.34
Median employed female age	.22	.05	.10	.02	-.38	-.18	.42	.58	-.18	-.25	.31	.11	-.60	-.58
Years of education[a]	-.96	-.61	.20	-.07	.21	.66	-.11	.20	.18	.75	-.13	.01	-.15	-.54
Percentage male[b]	.14	.25	.94	.82	-.01	-.02	-.18	-.05	.26	.32	-.23	-.26	.02	.07
Percentage of men black[c]	.45	.01	-.32	.05	.18	.41	.74	.63	.20	.28	.36	.56	.17	.43
Percentage of women black[c]	.40	-.14	-.16	.07	.04	.14	.62	.12	-.05	-.32	-.02	-.60	-.14	-.46
Percent of variance	65.23		17.63		6.63		3.98		2.43		1.93		1.45	
Canonical R	.94		.82		.67		.57		.48		.44		.39	
Λ before removing this function	.01**		.06**		.18**		.33**		.49**		.63**		.78*	

Note. N for discriminant analysis is 210. N's for correlations of discriminatory variables with discriminant scores range from 375 to 427.

[a] A weighted composite of men's and women's schooling for persons in the experienced labor force.

[b] Experienced civilian labor force.

[c] Employed workers.

* $p < .01$

** $p < .001$

Table 4

Efficiency of Various Sets of Discriminatory Variables in Classifying Occupations to Known Mobility-Based Groups

(N=210 Occupations)

Set of discriminatory variables	No. of functions	Pct. correctly classified[a]	κ	SE_κ
Occupational analysis data (DOT)	4	51.2	.461	.034
Worker characteristics				
Education	1	38.9	.308	.032
Race, sex, and age[b]	4	44.3	.371	.034
All	4	60.7	.558	.034
Occupational analysis data plus				
Education only	5	53.3	.483	.034
All personal characteristics	7	66.0	.623	.033

[a]Prior probabilities set proportional to group size.

[b]Percentage male, median male age, median female age, percentage males black, percentage females black.

Table 5

Standardized Multiple Discriminant Function Coefficients and Correlations of Discriminatory Variables with Functions in a Discriminant Analysis of Mobility-Based Occupational Groups: Occupational Characteristics (PAQ)

Discriminatory Variable	Fn 1		Fn 2		Fn 3		Fn 4		Fn 5		Fn 6	
	r	d	r	d	r	d	r	d	r	d	r	d
Responsibility	.74	.74	.17	.13	.11	.15	.55	.66	.14	.11	.06	.11
Machines, equipment	-.50	-.55	.05	.06	-.02	.01	.19	.23	-.59	-.59	-.19	-.10
Clerical activities	.30	.43	.01	-.09	.16	.22	-.34	-.35	-.37	-.45	.28	.33
Technical activities	-.03	-.12	.52	.54	.36	.26	.37	.32	-.15	-.05	-.46	-.41
Service activities	.16	.20	-.78	-.84	-.35	-.28	.18	.19	-.06	-.17	.10	.09
Irregular work schedules	.16	.18	.27	.14	.05	-.06	-.15	-.38	-.39	-.46	.29	.32
Routine work schedules	-.42	-.26	-.12	-.13	.09	.17	-.16	.01	.34	.38	-.15	-.16
Environmental awareness	-.32	-.48	.28	.48	-.20	-.14	-.02	.12	.38	.34	.48	.56
Physical activities	-.37	-.25	-.06	-.05	-.03	-.08	.41	.54	-.35	-.22	.41	.34
Supervising, directing	-.10	-.32	-.07	-.20	.11	.08	-.08	-.10	.07	-.28	-.08	-.38
Public contacts	-.10	-.15	-.38	-.39	.62	.83	.03	-.05	.08	.07	.20	.32
Unpleasant, hazardous envir.	-.43	-.43	.24	.14	.18	.11	.01	.02	-.15	-.10	.22	.19
Nontypical schedule	.07	-.05	-.03	.15	-.41	-.47	-.01	-.16	.15	-.01	.01	-.00
Percent of variance	43.23		24.34		10.35		9.39		5.90		3.04	
Canonical R	.91		.85		.72		.71		.62		.49	
Λ before removing this function	.00**		.02**		.08**		.16**		.32**		.52*	

Note. N for discriminant analysis is 148. N for correlations of discriminatory variables with discriminant scores is 304.

* $p < .01$

** $p < .001$

Table 6

Standardized Multiple Discriminant Function Coefficients and Correlations of Discriminatory Variables with Functions in a Discriminant Analysis of Mobility-Based Occupational Groups: Personal Characteristics

Discriminatory variable	Fn. 1		Fn. 2		Fn. 3		Fn. 4	
	r	d	r	d	r	d	r	d
Median employed male age	-.16	-.14	.23	.08	.01	.36	-.22	.29
Median employed female age	-.23	.03	.03	.09	-.32	-.53	-.81	-.96
Years of education[a]	.93	.94	.49	.36	-.08	-.41	.22	.15
Percentage male[b]	-.34	-.49	.87	.83	.06	-.15	.02	.12
Percentage black men[c]	-.41	-.26	-.52	-.32	-.70	-.61	.36	.82
Percentage black women[c]	-.34	.29	-.27	.36	-.70	-.47	-.11	-.52
Percent of variance	62.30		24.96		6.04		4.44	
Canonical R	.92		.82		.58		.52	
Λ before removing this function	.02*		.13*		.40*		.61*	

Note. N for discriminant analysis is 148. N's for correlations of discriminatory variables with discriminant scores range from 375 to 427.

[a]A weighted composite of men's and women's schooling for persons in the experienced civilian labor force.

[b]Experienced civilian labor force.

[c]Employed workers.

* $p < .001$

Table 7

Standardized Multiple Discriminant Function Coefficients and Correlations of Discriminatory Variables with Functions in a Discriminant Analysis of Mobility-Based Occupational Groups: Occupational and Personal Characteristics (PAQ)

Discriminatory Variable	Fn 1		Fn 2		Fn 3		Fn 4		Fn 5		Fn 6		Fn 7	
	r	d	r	d	r	d	r	d	r	d	r	d	r	d
Responsibility	.68	.48	.36	.32	-.36	-.31	-.06	.06	-.15	-.23	-.18	-.41	-.02	-.06
Machines, equipment	-.40	-.33	-.05	-.06	-.06	-.14	-.22	-.26	.56	.67	-.07	-.05	.25	.22
Clerical activities	.28	.37	-.02	.03	.28	.15	.33	.39	.29	.31	-.20	-.21	.10	.13
Technical activities	-.01	-.18	.52	.41	-.17	.03	-.01	-.04	.31	.23	.27	.15	.04	.13
Service activities	.25	.29	-.67	-.55	-.30	-.51	-.20	-.07	.00	.02	-.09	-.09	-.41	-.41
Irregular work schedules	.11	-.02	.20	-.04	.24	.40	.13	.20	.32	.40	-.23	-.21	-.23	-.35
Routine work schedules	-.40	-.11	-.16	-.08	-.02	-.15	.02	-.04	-.24	-.23	.19	.23	.49	.48
Environmental awareness	-.34	-.31	.24	.39	.10	.12	-.18	-.27	-.36	-.23	-.25	-.37	-.16	.00
Physical activities	-.30	-.10	-.04	.01	-.31	-.33	-.18	-.19	.26	.19	-.57	-.60	.22	.24
Supervising, directing	-.10	-.23	-.06	-.27	-.06	-.11	.05	-.02	-.06	.34	.19	.39	.05	.05
Public contacts	-.13	-.17	-.23	-.14	-.36	-.44	.59	.75	.00	.11	-.06	.06	-.12	-.18
Unpleasant, hazardous envir.	-.40	-.37	.21	.12	-.06	-.09	-.01	-.09	.11	.12	-.05	.04	-.06	-.14
Nontypical schedule	.07	-.04	-.05	-.05	.10	.36	-.26	-.35	-.21	-.04	-.12	-.09	.07	.04
Median employed male age	-.13	-.11	.14	-.05	-.08	.18	.08	.23	-.08	.34	.03	-.07	.20	-.01
Median employed female age	-.21	.03	-.02	.07	-.16	-.25	-.12	-.30	-.41	-.56	-.10	-.02	.47	.51
Years of education[a]	.82	.70	.47	.21	-.35	-.27	-.28	-.41	.14	.14	.38	.39	.06	.12
Percentage male[b]	-.43	-.41	.77	.56	-.34	-.36	.01	.03	-.14	-.20	.19	.19	-.16	-.33
Percentage black men[c]	-.33	-.22	-.51	-.08	.23	.41	-.36	-.41	-.05	-.27	.07	.37	-.26	-.29
Percentage black women[c]	-.28	.20	-.37	-.01	-.12	-.55	-.25	-.10	.15	.49	-.04	.02	-.09	.09

Percent of variance	50.93	19.40	8.70	8.03	5.01	2.45	2.17
Canonical R	.95	.89	.79	.78	.70	.57	.54
A before removing this function	.00**	.00**	.02**	.05**	.14**	.27**	.40*

Note. N for discriminant analysis is 148. N's for correlations of discriminatory variables with discriminant scores range from 304 to 427.

[a] A weighted composite of men's and women's schooling for persons in the experienced labor force.

[b] Experienced civilian labor force.

[c] Employed workers.

* $p < .01$

** $p < .001$

Table 8

Efficiency of Various Sets of Discriminatory Variables in Classifying Occupations to Known Mobility-Based Groups

(N=148 Occupations)

Set of discriminatory variables	Number of functions	Pct. correctly classified[a]	κ	SE_κ
Occupational analysis data (PAQ)	6	48.4	.438	.034
Worker characteristics				
Education	1	39.3	.319	.031
Race, sex, and age[b]	3	38.1	.312	.032
All	4	61.5	.569	.034
Occupational analysis data plus				
Education only	6	54.1	.498	.034
All personal characteristics	7	63.5	.597	.034

[a]Prior probabilities set proportional to group size.

[b]Percentage male, median male age, median female age, percentage males black, percentage females black.